

REMARKS

Claims 1-23 are pending in the application. Independent claims 1, 14, 17, 18 and 21 have been amended. Claim 24 has been cancelled. Reconsideration of the amended application is requested.

I. Rejection under 35 U.S.C. §102

Claims 18-22 and 24 are rejected under 35 U.S.C. §102(e) as being anticipated by *Kuniyasu* (US 6,744,797).

Claim 24 has been cancelled.

Amended independent claim 18 requires a diode-laser having a midline longitudinal axis, as stated below:

- 18. A diode-laser having a **midline** longitudinal axis, comprising:
 - a substrate;
 - a lower cladding region a lower waveguide region, an active region including a quantum-well layer, an upper waveguide region, and an upper cladding region, grown in listed order on said substrate, said substrate and said regions grown thereon having two, parallel facets, the distance between said facets defining the length of the diode laser;
 - an elongated electrode having a length less than the length of the diode-laser on said upper cladding region, arranged perpendicular to said facets and defining a pumped stripe of said diode-laser, the **midline** longitudinal axis of the diode-laser extending through said pumped stripe of the diode-laser; and
 - at least one etched area in said upper cladding region of the diode-laser outside said strip section and aligned with said **midline** longitudinal axis, said at least one etched area having a maximum depth less than or equal to the thickness of said upper cladding region and having a shape and depth profile selected to provide diverging lens effect for laser radiation circulating in said waveguide-regions. (*emphasis added*).

Kuniyasu does not disclose this limitation. *Kuniyasu* discloses a semiconductor laser device having a pair of “ridge grooves” that are formed to be parallel to the midline longitudinal axis (see Figs. 1(b)-1(d)), with “current non-injection regions” being formed “between the two ridge grooves” (col. 4, lines 4-14). *Kuniyasu* does not disclose “at least one etched area...aligned with said midline longitudinal axis...having a shape and depth profile selected to provide diverging lens effect” as required by claim 18. The ridge grooves or “trenches” (identified in the Office Action on p.3) run parallel to the midline longitudinal axis outside the current non-injection regions of *Kuniyasu*. There is no disclosure in *Kuniyasu* as to how ridge grooves located outside the current non-injection regions can provide a diverging lens effect, or how such an effect could be affected by

the shape and depth profile of those grooves. Further, it would not be obvious that ridge grooves outside the current non-injection regions could be used to provide a diverging lens effect with any likelihood of success. Because *Kuniyasu* does not disclose, teach or suggest these limitations, amended claim 18, and its dependent claims 19 and 20, cannot be anticipated or rendered obvious by *Kuniyasu*.

Applicants' amended independent claim 21 defines a diode-laser defined by:

a multi-layer structure including at least one cladding layer; and
an electrode electrically coupled to said cladding layer with at least one end of said electrode being spaced from an end face of the diode laser to define an unpumped section thereof, and wherein said cladding layer includes a recessed area **that defines a diverging lens structure that is aligned with said unpumped area** and having a configuration which modifies the effective refractive index of the unpumped area in order to improve the mode performance of the laser (*emphasis added*).

As discussed above with respect to amended claim 18, *Kuniyasu* discloses ridge grooves that are formed outside the current non-injection regions. There is no disclosure, teaching, or suggestion provided by *Kuniyasu* as to how these trench grooves located outside the non-injection region can serve as divergent lens structures or can modify the "effective refractive index of the unpumped area" as required by Applicants' amended claim 21. As such, *Kuniyasu* cannot anticipate or render obvious amended claim 21 and its dependent claim 22 and 23.

Applicants therefore respectfully request that the rejection with respect to claims 18-22 and 23 be withdrawn.

II. Rejection under 35 U.S.C. §103

Claims 1, 3-6, 8-17, and 23 are rejected under 35 U.S.C. §103(a) as being obvious over *Kuniyasu* in view of *Tanaka* (US 6,430,204).

Applicants' amended claim 1 requires:

a substrate having two facets, the distance between said facets defining the length of the diode laser;
a lower cladding region, a lower waveguide region, an active region including a quantum-well layer, an upper waveguide region, and an upper cladding region, formed on said substrate;
an elongated electrode electrically coupled to said upper cladding region and located between said facets and defining an elongated pumped section of the diode laser, said electrode

having a length less than the length of the diode-laser thereby leaving at least one unpumped section adjacent said diode-laser at a first end of said electrode, the longitudinal axis of the diode-laser extending through said pumped and unpumped sections of the diode-laser, said quantum-well layer having a higher bandgap in said unpumped section than in said pumped section; and
at least one etched area formed in said upper cladding region of said unpumped section of diode-laser, said etched area aligned on the longitudinal axis of the diode-laser, **defining a diverging lens structure** and having a maximum depth less than or equal to the total thickness of said upper cladding region. (*emphasis added*).

This limitation is neither taught nor suggested by either *Kuniyasu* or *Tanaka*, whether considered individually or in combination.

As recognized in the Office Action, *Kuniyasu* does not teach a quantum well layer having a higher bandgap in the unpumped section than in the pumped section. *Tanaka* is cited as teaching an un-pumped region at a higher bandgap than the pumped region, but this section of *Tanaka* is related to the waveguide layer. *Tanaka* does not teach or suggest the quantum-well layer having a higher bandgap in the unpumped section than in the pumped section. Further, neither reference teaches or suggests at least one etched area in said upper cladding region of the unpumped section that defines a diverging lens structure, as required by amended claim 1. As such, amended claim 1 and its dependent claims 3-13 cannot be rendered obvious by the *Kuniyasu/Tanaka* reference combination.

Applicants' amended independent claims 14 also require "said quantum-well layer having a higher bandgap in said unpumped section(s) than in said pumped section" and "at least one etched area in said upper cladding region of each of said unpumped section(s)...defining a diverging lens structure". Thus, for the reasons set forth above with respect to amended claim 1, amended claim 14 and its dependent claims 15-16 cannot be rendered obvious by the *Kuniyasu/Tanaka* reference combination.

Applicant's amended independent claim 17 requires "at least one etched area...aligned on the midline longitudinal axis of the diode-laser...". As discussed above with respect to amended claim 18, *Kuniyasu* disclose a pair of ridge groove trenches that are formed outside the current non-injection regions of the disclosed structure and that are certainly not formed to be aligned with the longitudinal midline of the structure. Nothing in *Tanaka* either teaches or

suggest the longitudinal midline structure recited in amended claim 17. Thus, amended claim 17 cannot be rendered obvious by the *Kuniyasu/Tanaka* reference combination.

In view of the above, it is respectfully submitted that the application is now in condition for allowance.

Respectfully submitted,

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